

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
 United States Patent and Trademark  
 Office  
 Box PCT  
 Washington, D.C. 20231  
 ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

|   |   |
|---|---|
| Date of mailing (day/month/year)<br>13 March 2000 (13.03.00)            |   |
| International application No.<br>PCT/AU99/00707                         | Applicant's or agent's file reference<br>86022              |
| International filing date (day/month/year)<br>31 August 1999 (31.08.99) | Priority date (day/month/year)<br>31 August 1998 (31.08.98) |
| Applicant<br>BRAGAGNOLO, Julio et al                                    |   |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

17 February 2000 (17.02.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

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| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br><br>Facsimile No.: (41-22) 740.14.35 | Authorized officer<br><br>Juan Cruz<br><br>Telephone No.: (41-22) 338.83.38 |
|---|---|

Translation

09786098

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |   |  |
|---|---|--|
| Applicant's or agent's file reference<br>Ed 13398 WO                                      | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |  |
| International application No.<br>PCT/DE99/02823   | International filing date (day/month/year)<br>01 September 1999 (01.09.99)  | Priority date (day/month/year)<br>01 September 1998 (01.09.98) |
| International Patent Classification (IPC) or national classification and IPC<br>B60J 7/06 |   |  |
| Applicant<br>EDSCHA LKW-SCHIEBEVERDECKE GMBH  |   |  |

|   |  |
|---|--|
| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of _____ sheets.</p>   |  |
| <p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input checked="" type="checkbox"/> Certain defects in the international application</p> <p>VIII <input checked="" type="checkbox"/> Certain observations on the international application</p> |  |

|  |  |
|--|--|
| Date of submission of the demand<br>21 March 2000 (21.03.00) | Date of completion of this report<br>28 July 2000 (28.07.2000) |
| Name and mailing address of the IPEA/EP                      | Authorized officer   |
| Facsimile No.  | Telephone No.  |

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/DE99/02823

## I. Basis of the report

1. This report has been drawn on the basis of (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

- ☐ the international application as originally filed.
- ☒ the description, pages 1-11, as originally filed,  
 pages \_\_\_\_\_, filed with the demand,  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.
- ☒ the claims, Nos. 1-16, as originally filed,  
 Nos. \_\_\_\_\_, as amended under Article 19,  
 Nos. \_\_\_\_\_, filed with the demand,  
 Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_.
- ☒ the drawings, sheets/fig 1/10-10/10, as originally filed,  
 sheets/fig \_\_\_\_\_, filed with the demand,  
 sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/DE 99/02823

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

|                               |        |        |     |
|-------------------------------|--------|--------|-----|
| Novelty (N)                   | Claims | 1 - 16 | YES |
|                               | Claims |        | NO  |
| Inventive step (IS)           | Claims | 1 - 16 | YES |
|                               | Claims |        | NO  |
| Industrial applicability (IA) | Claims | 1 - 16 | YES |
|                               | Claims |        | NO  |

### 2. Citations and explanations

#### 1. Prior art

This report makes reference to the following document:

D1: EP-A-0 273 740

#### 2. Independent Claim 1

##### 2.1 Novelty

Document D1, which is considered to be the closest prior art, shows and describes a cover according to the preamble of Claim 1.

The subject matter of the present Claim 1 differs from the above by the features of its characterizing portion.

Consequently, the present application meets the criterion specified in PCT Article 33(2), because the subject matter of the sole independent claim, Claim 1, is novel, having regard to the prior art as defined in the Regulations (PCT Rule 64.1 - 64.3).

.../...

(Continuation of V.2)

## **2.2. Inventive step**

Starting out from the above-mentioned prior art, the problem to be solved by the present invention would therefore appear to be to develop a cover according to D1 so as to ensure that the tarpaulin is regularly folded between the slidable arched framework sections when the cover is open.

The solution according to Claim 1 does not appear to be known from any single document in the proceedings or to be suggested by the prior art as a whole.

Consequently, the present application meets the criterion specified in PCT Article 33(3), because the subject matter of Claim 1 involves an inventive step (PCT Rule 65.1, 65.2).

## **2.3. Industrial applicability**

The subject matter of Claim 1 also appears to meet the requirements of PCT Article 33(4), because it can evidently be made and used at least in the field of automotive technology.

## **3. Claims dependent on Claim 1**

Dependent Claims 2 to 16, which define further embodiments of the invention according to Claim 1, likewise appear to meet the requirements of PCT Article 33(1) to (4).

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No.

PCT/DE 99/02823

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

1. Contrary to PCT Rule 5.1(a)(ii), the description does not cite document D1 or indicate the relevant prior art disclosed therein.

2. The number of the document **US-A-4 259 346** is obviously incorrect.

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No.

PCT/DE 99/02823

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

It is clear from the description, page 8, lines 20 - 22 that the feature

**the transverse members (12) of the auxiliary arched framework sections (10) are coplanar with the transverse members (11) of the sliding arched framework sections (4) when the cover is closed**

is necessary for the definition of the invention.

Since independent Claim 1 does not contain this feature, it does not comply with the requirement of PCT Article 6 in conjunction with PCT Rule 6.3(b) that every independent claim must contain all the technical features which are necessary for the definition of the invention.

16

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**  
(PCT Article 36 and Rule 70)

REC'D 04 AUG 2000

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|--|---|--|
| Applicant's or agent's file reference<br>86022   | <b>FOR FURTHER ACTION</b>   | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416). |
| International application No.<br><b>PCT/AU99/00707</b>   | International filing date ( <i>day/month/year</i> )<br>31 August 1999 | Priority Date ( <i>day/month/year</i> )<br>31 August 1998  |
| International Patent Classification (IPC) or national classification and IPC<br><br><b>Int. Cl. <sup>7</sup> E04D 13/18, F24J 2/52</b> |   |  |
| Applicant<br><b>PACIFIC SOLAR PTY LIMITED et al</b>  |   |  |

|    |   |
|----|---|
| 1. | This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.  |
| 2. | This REPORT consists of a total of 4 sheets, including this cover sheet.<br><br><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).<br><br>These annexes consist of a total of 3 sheet(s).  |
| 3. | This report contains indications relating to the following items:<br><br>I <input checked="" type="checkbox"/> Basis of the report<br>II <input type="checkbox"/> Priority<br>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability<br>IV <input type="checkbox"/> Lack of unity of invention<br>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement<br>VI <input type="checkbox"/> Certain documents cited<br>VII <input type="checkbox"/> Certain defects in the international application<br>VIII <input type="checkbox"/> Certain observations on the international application |

|   |   |
|---|---|
| Date of submission of the demand<br>17 February 2000  | Date of completion of the report<br>27 July 2000                                  |
| Name and mailing address of the IPEA/AU<br><br>AUSTRALIAN PATENT OFFICE<br>PO BOX 200, WODEN ACT 2606, AUSTRALIA<br>E-mail address: pct@ipaustalia.gov.au<br>Facsimile No. (02) 6285 3929 | Authorized Officer<br><br><b>MICHAEL HALL</b><br><br>Telephone No. (02) 6283 2474 |



**I. Basis of the report**

1. With regard to the elements of the international application:\*
- ☐ the international application as originally filed.
- ☒ the description, pages 1-9, as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☒ the claims, page 10, as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages 11-13, received on 2 May 2000 with the letter of 2 May 2000
- ☒ the drawings, pages 1-9, as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of
2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.  
These elements were available or furnished to this Authority in the following language which is:
- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).
3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, was on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished
4. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.
5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

|                               |                           |     |
|-------------------------------|---------------------------|-----|
| Novelty (N)                   | Claims 1-10, 12-20, 22-26 | YES |
|                               | Claims 11, 21             | NO  |
| Inventive step (IS)           | Claims 1-10, 12-20, 22-26 | YES |
|                               | Claims 11, 21             | NO  |
| Industrial applicability (IA) | Claims 1-26               | YES |
|                               | Claims                    | NO  |

**2. Citations and explanations (Rule 70.7)**Citations

D1 : US 5112408  
D2 : US 4636577  
D3 : US 4189881  
D4 : DE 3419299  
D5 : US 51936063

NOVELTY (N) AND INVENTIVE STEP (IS) claims 11, 21

Claim 11: D1-D4 teach support elements for releasably engaging and supporting photovoltaic panels in predefined juxtaposition, where the support elements have engagement means for linking adjacent support elements (eg, Figures 2, 6-7 of D1 with engagement means 1g, 1i; Figures 1,3 of D2 with engagement means 32, 34; Figures 3-4 of D3 with engagement means 8; and Figures 2, 5 of D4 with engagement means 8). D5 teaches support frames 16, 18 for releasably engaging and supporting display panels 12, 14 in predetermined juxtaposition, with engagement means 20 for linking adjacent support frames (eg, column 3 lines 8-50, column 4 lines 56-59, Figures 1, 4 of D5). Hence claim 11 is not novel or inventive in the light of any one of D1-D5.

The applicant has argued with respect to D1-D4 that juxtaposition is provided by supporting roof elements such as battens. However, I consider that the above-identified engagement means are essential to the predetermined juxtapositions in D1-D4, and hence fall within the scope of claim 11. I further note that in the instant application support is also ultimately provided by the roof battens (eg, Figure 7), yet this does not remove the role of engagement clips 70 (eg, Figure 6) in determining the juxtaposition of panels. The applicant has also argued with respect to D5 that the engagement means 20 do not induce a *predefined* juxtaposition of panels, in that they may be used to fix the panels in one of a number of different rotational relationships. However, I consider that each of these relationships is predefined, where a given fixed rotational relationship is selectable by the user. The claim is not limited in scope to a *unique* predefined juxtaposition. Indeed, as exemplified in Figure 10 of the instant application, the panels therein may be fixed in at least *two* predefined juxtapositions.

Claim 21: D3 teaches engagement means 8 as per claim 21 (column 1 line 55 to column 2 line 9, Figures 2-3), and hence the features added by this claim to claim 11 are not novel or inventive in the light of D3.

Continued

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

**Continuation of Box V**

No obvious combination of the prior art teaches or suggests attachment of support elements on an existing roof as per claims 1-10; nor a support element comprising a longitudinal member and two transverse members as per claims 12-20 and 22; nor a combination of parts as per claims 23-26 suitable for assembling a supporting frame and fitting a photovoltaic panel to a roof. Hence these claims are novel and have an inventive step in the light of the prior art.

**INDUSTRIAL APPLICABILITY (IA)**

The subject matter of the claims is applicable to the roof-mounting of solar panels.

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PATENT COOPERATION TREATY  
**PCT**

REC'D 13 FEB 2001

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|  |   |  |
|--|---|--|
| Applicant's or agent's file reference<br>40136121  | <b>FOR FURTHER ACTION</b>   | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416). |
| International Application No.<br><b>PCT/AU99/00708</b>   | International Filing Date ( <i>day/month/year</i> )<br>1 September 1999 | Priority Date ( <i>day/month/year</i> )<br>1 September 1998  |
| International Patent Classification (IPC) or national classification and IPC<br><br>Int. Cl. <sup>7</sup> F02B 23/04, 31/00, 77/11 |   |  |
| Applicant<br>GALBRAITH ENGINEERING PTY LTD et al   |   |  |

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3. This report contains indications relating to the following items:

- |      |                                     |   |
|------|-------------------------------------|---|
| I    | <input checked="" type="checkbox"/> | Basis of the report   |
| II   | <input type="checkbox"/>            | Priority  |
| III  | <input type="checkbox"/>            | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| IV   | <input type="checkbox"/>            | Lack of unity of invention  |
| V    | <input checked="" type="checkbox"/> | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI   | <input type="checkbox"/>            | Certain documents cited   |
| VII  | <input type="checkbox"/>            | Certain defects in the international application  |
| VIII | <input type="checkbox"/>            | Certain observations on the international application   |

|   |   |
|---|---|
| Date of submission of the demand<br>24 March 2000   | Date of completion of the report<br>2 January 2001                            |
| Name and mailing address of the IPEA/AU<br>AUSTRALIAN PATENT OFFICE<br>PO BOX 200, WODEN ACT 2606, AUSTRALIA<br>E-mail address: pct@ipaustalia.gov.au<br>Facsimile No. (02) 6285 3929 | Authorized Officer<br><br><b>R. SUBBARAYAN</b><br>Telephone No. (02) 62832377 |

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed.
- ☐ the description,      pages , as originally filed,  
pages , filed with the demand,  
pages , received on      with the letter of
- ☐ the claims,      pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages , received on      with the letter of
- ☐ the drawings,      pages , as originally filed,  
pages , filed with the demand,  
pages , received on      with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on      with the letter of

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, was on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description,      pages
- ☐ the claims,      Nos.
- ☐ the drawings,      sheets/fig.

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)

Claims 1-49

YES

Claims

NO

Inventive step (IS)

Claims 1-49

YES

Claims

NO

Industrial applicability (IA)

Claims 1-49

YES

Claims

NO

**2. Citations and explanations (Rule 70.7)**

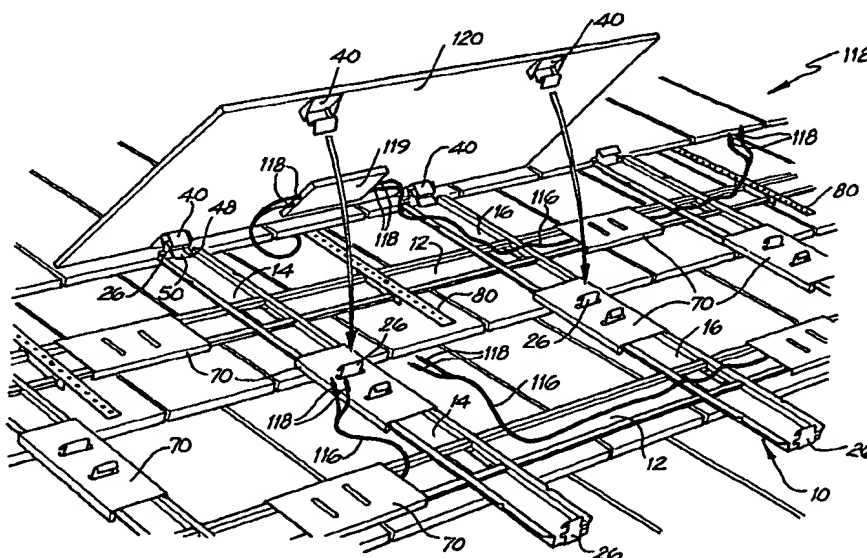
None of the documents cited in the international search report discloses an engine having a variable volume working chamber including at least two sub-chambers wherein the air admission means, the exhaust means and the sub-chambers are arranged such that a swirl of gas is generated and maintained about the axis in both of the sub-chambers during operation of the engine. The claimed invention is therefore considered novel, inventive and industrially applicable.



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|  |   |  |
|--|---|--|
| (51) International Patent Classification 6 :<br><b>E04D 13/18, F24J 2/52</b>   | <b>A1</b>   | (11) International Publication Number: <b>WO 00/12839</b><br>(43) International Publication Date: <b>9 March 2000 (09.03.00)</b> |
| <p>(21) International Application Number: <b>PCT/AU99/00707</b></p> <p>(22) International Filing Date: <b>31 August 1999 (31.08.99)</b></p> <p>(30) Priority Data:<br/><b>PP 5586 31 August 1998 (31.08.98) AU</b></p> <p>(71) Applicant (for all designated States except US): <b>PACIFIC SOLAR PTY. LTD. [AU/AU]; 82-86 Bay Street, Botany, NSW 2019 (AU).</b></p> <p>(72) Inventors; and<br/>(75) Inventors/Applicants (for US only): <b>BRAGAGNOLO, Julio [AR/AU]; 3/78 Benelong Road, Cremorne, NSW 2090 (AU). WOOD, Noel, Sydney, David [AU/AU]; 136 Middle Harbour Road, Lindfield, NSW 2070 (AU).</b></p> <p>(74) Agent: <b>F.B. RICE &amp; CO.; 605 Darling Street, Balmain, NSW 2041 (AU).</b></p> | <p>(81) Designated States: <b>AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b><br/><i>With international search report.</i></p> |  |

(54) Title: PANEL MOUNTING FRAME AND METHOD



## (57) Abstract

A support element (10) for mounting a solar panel has an elongate member (12) and two transverse members (14, 16), and may be fixed to a roof (112) via a fastener strap (80). Adjacent support elements (10) are connected in fixed juxtaposition via engagement means (70), to form a modular framework. Each support element has means (26) for releasably engaging a panel (120). The transverse members (14, 16) are located midway between the centre and either end of the elongate member (12), so that one can optionally form a triangular or diamond shaped framework by connecting support elements (10) in staggered rows of varying lengths.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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| AT | Austria                  | FR | France                                   | LU | Luxembourg                                   | SN | Senegal                  |
| AU | Australia                | GA | Gabon                                    | LV | Latvia                                       | SZ | Swaziland                |
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| BJ | Benin                    | IE | Ireland                                  | MR | Mauritania                                   | UA | Ukraine                  |
| BR | Brazil                   | IL | Israel                                   | MW | Malawi                                       | UG | Uganda                   |
| BY | Belarus                  | IS | Iceland                                  | MX | Mexico                                       | US | United States of America |
| CA | Canada                   | IT | Italy                                    | NE | Niger  | UZ | Uzbekistan               |
| CF | Central African Republic | JP | Japan                                    | NL | Netherlands                                  | VN | Viet Nam                 |
| CG | Congo                    | KE | Kenya                                    | NO | Norway                                       | YU | Yugoslavia               |
| CH | Switzerland              | KG | Kyrgyzstan                               | NZ | New Zealand                                  | ZW | Zimbabwe                 |
| CI | Côte d'Ivoire            | KP | Democratic People's<br>Republic of Korea | PL | Poland                                       |    |                          |
| CM | Cameroon                 | KR | Republic of Korea                        | PT | Portugal                                     |    |                          |
| CN | China                    | KZ | Kazakhstan                               | RO | Romania                                      |    |                          |
| CU | Cuba                     | LC | Saint Lucia                              | RU | Russian Federation                           |    |                          |
| CZ | Czech Republic           | LI | Liechtenstein                            | SD | Sudan  |    |                          |
| DE | Germany                  | LK | Sri Lanka                                | SE | Sweden                                       |    |                          |
| DK | Denmark                  | LR | Liberia                                  | SG | Singapore                                    |    |                          |
| EE | Estonia                  |    |  |    |  |    |                          |



## "Panel mounting frame and method"

### Field of the Invention

This invention relates to a frame for mounting a panel, particularly a solar (photovoltaic) panel or the like, to a roof, and also to a method of fixing such a frame to a roof and mounting a panel thereon.

### Background of the Invention

To date, solar panels have been mounted hard against or standing-off from roofs in an array, individually fixed to the roof structure by attachment brackets. It is important that adjacent panels are mounted in a co-planar fashion, in-line and equally spaced apart, since due to the reflective nature of the solar panels, any misalignment is obvious and unacceptable for aesthetic reasons. The tolerances usual in roof structure construction are translated to the solar panels through the brackets, making it difficult to achieve the desired accuracy. Additionally, the labour costs of securing such brackets on roofs is unacceptably high.

The shortcomings associated with the abovementioned bracket mounting method have been overcome by using substantially rigid support structures onto which an array of solar panels is attached. The structure can provide the necessary alignment tolerances to meet aesthetic requirements.

However, the size of such support structures requires the use of a crane or other heavy lifting machine to elevate them from the ground to above the roof. Each structure must be purpose designed for the particular array of panels. This negates the benefit associated with the modularity of solar panels. It can also lead to difficulties in removing a solar panel for the purpose of repair or replacement.

The present invention seeks to alleviate the disadvantages of the prior art and provide a method and apparatus for accurate releasable mounting of an array of solar panels or the like onto pitched or flat roofs, without compromising the benefits of modularity and at a reasonable cost.

### Summary of the Invention

In a first broad aspect of the present invention, there is provided a method of forming a framework for mounting panels, in particular photovoltaic panels or the like, on a roof, the method comprising the steps of:

fixing a first panel support element to a roof, said first panel support element having engagement means for linking in predetermined juxtaposition with adjacent like panel support elements, each panel support

element including support means for releasably receiving and supporting a respective one of the panels;

5 locating a second panel support element adjacent the first element and fixing the second element in a predetermined juxtaposition with the first element by the engagement means; and

attaching one of the panels to each panel support element, the arrangement being such that the attached panels are disposed in predefined juxtaposition.

10 The method of the present invention allows a substantially co-planar array of photovoltaic panels to be provided on a roof largely independently of the evenness of the roof. The underlying support structure, despite being modular can, when assembled, provide a substantially rigid structure to support the substantially co-planar array of photovoltaic panels.

15 In one particular embodiment of the method, when a framework is being applied to a tiled roof, the method further includes the steps of:

removing a tile from the roof;

attaching a depending fastener to a rafter, or other structural member of the roof;

20 replacing the tile on the roof such that the upper end of the fastener is covered but leaving the lower part of the fastener exposed; and

attaching the panel support element to the lower part of the fastener.

In the case of roofs made of sheet material, such as roofs made of corrugated metal, fasteners may also be attached to a structural member of the roof such as a rafter, purlin or the like through the sheet material.

25 Each panel in a series may be electrically connected to its adjacent panels by lengths of cable which may be plugged directly into an inverter associated with the photovoltaic panel. The inverters may be mounted on the back of the specific panels or, alternatively, on respective panel support elements.

30 Preferably, the inverters are provided with an output connection and at least one input connection connected in parallel to facilitate parallel electrical connection of a series of inverters.

35 The invention also provides a panel support element having engagement means being adapted for linking with an adjacent like panel support element, each frame element being adapted releasably to support a panel, the engagement means being configured for securing adjacent panel

supports such that their respective solar panels are disposed in predefined juxtaposition.

5 In a preferred embodiment, the panel support element comprises a first elongate member having a length  $2L$  and two transversely oriented elongate members each having a length  $L$  symmetrically disposed midway between the centre and either end of the first elongate member. Preferably hinge means are provided at each end of the transverse elongate members which are configured to co-operate with a hinge bracket provided on the reverse side of the photovoltaic panel.

10 Typically, the cross-section of the members of the panel support elements is substantially constant along the length of each of the members of the support element and is preferably an inverted top hat shape when the support elements are fabricated from folded sheet metal. When the support element is manufactured from other materials such as moulded plastics materials, different sectional shapes may be employed, such as channel or box sections, or variations of such section shapes including an undercut portion, horizontal ridge or groove. However, the basic function of the support element is not dictated by the material or the cross-section shape of the members.

20 Each fastener for attaching the panel support element to the roof preferably includes an elongate metal strap, optionally provided with preformed holes to facilitate attachment to the roof and the support element. An attachment clip is preferably also provided, which cooperates with the cross-section shape of the members of the panel support element, to clip onto the support element, preferably by engaging under the undercut portion, horizontal ridge or groove. The attachment clip is preferably provided with a plurality of holes to allow adjustable connection of the fastener strap by way of a screw or rivet. Preferably the holes in the attachment clip differ in pitch with respect to the fastener strap to allow a vernier style fine adjustment of the location of the support element. The attachment clip is preferably slidingly attached to the respective member of the support element to provide adjustment of the location of the support element in the direction of the respective member.

30 Preferably, the engagement means comprise bracket elements of a predetermined length defining mating means adapted to engage with

corresponding mating means provided at a predetermined location at or adjacent each end of the members of the panel support element.

The corresponding mating means may include a pair of detents provided adjacent each end of the first elongate member and the two  
5 transverse elongate members.

Both the panel support elements and the photovoltaic panels have a length which is twice their width. This makes the design very flexible in providing an array of panels for roof faces of differing shapes. For example if an array of panels is to be fitted to a (triangular) gable end, the panels can be  
10 arranged in a landscape format (ie with the 2L side horizontally oriented) and with one panel disposed above two panels, those two panels above three panels, those three panels above four panels etc. Alternatively, the panels can be assembled to provide a substantially rectangular array with the panels in either a landscape or portrait format.

15 After the frame work of panel support elements has been placed on a roof, it may be pre-wired leaving connectors located on each frame element for plugging into the photovoltaic panel subsequently placed on that element.

The system can be provided in modular kit form with all the parts necessary for assembling and fitting a photovoltaic panel to a roof, including:

20 a fastener strap and attachment clip;  
a panel support element;  
three connector bracket elements;  
four hinge brackets arranged to be affixed to the rear side of a photovoltaic panel; and  
25 connector cable of sufficient length to reach an adjacent juxtaposed panel or junction box.

Preferably the kit also includes photovoltaic panel and optionally an inverter arranged to convert a dc power output of the photovoltaic panel to ac power for connection to an ac power grid or a grid connected building  
30 distribution system.

The above can be provided in a single box. If the array is to have, say, six panels, six such boxes are required. A single separate box contains all of the components required to add a single panel to an array the kit component list being independent of the number of panels in the array.

35 Thus the present invention provides a single system and method which enables a framework of any required shape and size, to be accurately

located on a flat or pitched, tiled or non-tiled, roof, which enables accurate and secure location of the photovoltaic panels.

Throughout this specification, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will  
5 be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

#### **Brief Description of the Drawings**

Specific embodiments of the invention will now be described, by way  
10 of example only and with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a panel support element;

Figure 2 is a perspective view of a hinge bracket;

Figure 3 is a perspective view of an attachment clip;

Figure 4 is a perspective view of a connector bracket;

15 Figure 5 is a perspective view of a fastener strap;

Figure 6 shows a typical tiled roof with an array of panel support elements attached to the roof.

Figure 7 is a cross-section on line VII-VII of Figure 6;

Figure 8 shows wiring laid out over the panel support elements and a  
20 solar photovoltaic panel being lowered onto a panel support element;

Figure 9 is cross-section through Figure 8; and

Figure 10 illustrates a roof after panels have been positioned on all the panel support elements provided on the roof.

#### **Detailed Description of the Preferred Embodiment**

Referring to the drawings, Figure 1 illustrates a panel support element  
25 of the present invention, generally indicated at 10. The panel support element 10 comprises a first elongate frame member 12 and two transverse frame members 14, 16 which are symmetrically disposed about the centre and central longitudinal axis of the elongate member 12. The panel support  
30 element has a length (2L) which is approximately twice its width (L). The transverse frame members are spaced a distance L apart.

In cross-section the frame members 12, 14, 16 have an inverted top hat shape defining flanges 20 extending generally parallel to the plane of the panel support element.

35 Near each end of each elongate frame element a pair of V shaped detents 24 is defined in the flanges 20, as illustrated.

An upstanding hooked projection or hinge 26 is defined at each end of each transverse frame element.

Figure 2 shows a hinge bracket 40 made from stainless steel. The bracket comprises a generally planar portion 41 along the sides of which extend two triangular wings 42, 44 in a plane generally perpendicular to the planar portion 41. Extending away from the planar portion 41, in a plane perpendicular to both the wings and the planar portion, is a shaped sheet including a first portion 46 which extends perpendicularly away from the planar portion 41, a step portion 48 perpendicular to portion 46 and a further planar portion 50 which extends at an angle of about 30° to the planar portion 46. In use four such brackets are fixed to the reverse side of a photovoltaic panel 120, towards the corners of two opposed edges of the panel (referred to herein as quarter points), as is best seen in Figure 8, with the portion 41 fixed by adhesive tape or the like to the reverse side of the panel 120.

Figure 3 shows an attachment clip 60 which is generally U-shaped in section and has two pairs of slots 66 defined in its sides 68, which are shaped to snap-fasten over flanges 20 of the panel support element 10. The base 62 defines a series of holes 64, for connection of the support element to a mounting mechanism.

Figure 4 illustrates a connector bracket 70 which is generally U shaped having a base 72 in which there are two spaced transverse slots 74. At each side of each end of the connector there is a triangular projection 78 which, as is explained in more detail below, slots into detents 24 in flange 20 of the panel support element 10.

Figure 5 illustrates a fastener strap 80 comprising elongate strip of planar metal provided with a series of holes 82 spaced along its central longitudinal axis. The holes 82 are provided, on the one hand, for attachment of the strap to a roof component such as a rafter, and on the other hand, for attachment of the strap to the attachment clip 60. The holes 82 in the strap 80 are spaced at a different pitch to that of the holes 64 in the attachment clip 60, such that a vernier adjustment is provided between the strap 80 and the clip 60. In the illustrated embodiment the clip 60 has nine equally spaced holes 64 and over the same total length the strap 80 has ten holes. Attachment of the strap 80 to the roof is by way of suitable screws,

nails or rivets and attachment of the strap to the clip 60 is by way of nut and bolt, self tapping screw, rivet, or suitable similar fastener.

Figures 6 onwards illustrate the use of the frame elements and other components of the present invention to install an array of solar panels on a roof. The roof includes a series of rafters supporting tiles 114.

Figure 6 illustrates a method of fixing frame elements to a tiled roof 112. First a number of tiles 114a are removed from the roof to reveal the supporting rafters of the roof. Next, fastener straps 80 are fixed to the rafters, using screws, nails or the like, one end being fixed to rafter and the other end depending down the roof parallel to the rafter. When the tiles 114a are replaced as shown in Figure 6, the lower ends of the fastener straps 80 are visible. In Figure 6, two fastener straps are shown bent upwards, this is for illustrative purposes only, to show attachment brackets 60 more clearly.

A first panel support element 10a is then positioned on the roof with a attachment clip 60 attached as shown in Figure 7 and the attachment clip is fixed to the fastener strap 80, by a pop rivet 126 which passes through one of the holes 82 in the fastener strap 80 and a suitably aligned hole 64 in the attachment clip 60. At this stage the panel support element 10a may move laterally along the roof relative to the strap 80 and attachment clip 60.

A second panel support element 10b is juxtaposed a set distance from the first panel support element 10a which has already positioned on the roof the distance between the two panel support elements 10a, 10b being set by means of a connector bracket 70 which connects them. The projections 78 at the ends of the connector brackets snap into the detents 24 on the members of the panel support elements and hence hold the elements in a pre-determined position relative to each other.

Further panel support elements are then fixed to the roof using further connector brackets, until a row of linked panel support elements is formed. Fastener straps 80 are used as required to assist in locating and supporting the panel support elements 10 although it is not necessary to have a fastener strap for each panel support element as the panel support elements are supported by the adjacent juxtaposed panel support elements in the array, particularly when several row of support elements are used. Large assemblies of panel support elements can be supported by as few as three or four fastener straps.

Once a complete row of panel support element is located on a roof, a further row of panel support elements can be added to the roof connected to the first row using the connector brackets 70. The slots 74 in the brackets 70 allow the projections 26 on the panel support elements to pass through the brackets. The number of rows which can be provided is limited only by the size of the roof. In Figure 6 two rows are shown only.

Figure 7 shows a vertical cross-section through a panel support element 10, an attachment clip 60 and a fastener strap 80, showing the relationship between the panel support element 10, the fastener strap 80 and attachment clip 60, which hold the support element 10 to the roof, and the roof batten 127, to which the fastener strap 80 is fastened by a nail or screw 128, and the roof tiles 114, 114a.

As shown in Figure 8, after the panel support elements 10 are located and fastened to the roof, connector wires 116 are laid out on the array of panel support elements. The wires 116 pass under the connector brackets 70 as this part of the wire is not located below the photovoltaic panel which is to be supported by the panel support element and thus would otherwise be exposed to ultraviolet radiation. Both ends of the wire are terminated by connector elements 118 for plugging into an inverter 119 on the rear of a photovoltaic panel 120. The wiring extends from panel support element to panel support element and only a single pair of wires extend into the roof space. The panels in the array will generally be connected in parallel, but may also be connected in series, as for example in some dc installations.

Figure 8 also illustrates a solar panel 120 in the process of being lowered onto it's respective support element 10. As can be seen, the rear side of the panel 120 is fitted with four hinge brackets 40 located at the quarter points of the panel and fixed to the panel by double sided tape (not shown). The hinge brackets 40 engage with the upstanding projections 26 of the panel support element. The upstanding projections 26 of the panel support element 10 and brackets 40, co-operate to act as hinges and allow the panel 120 to be lowered onto the panel support element with the load carried by the uppermost tips of a pair of the projections 26 during the lowering operation and the tips of all four projections 26 once the panel is in it's final position. An inverter is also located on the underside of the photovoltaic panel. The connector terminations 118 of the wiring 116 are pushed into mating connectors (not shown) in the inverter on the photovoltaic panel and



the panel is lowered until the free brackets 40 engage their respective projection 26. Figure 9 shows a vertical cross-section through the panel 120 and support element 10 assembly, and illustrates the panel 120 engaged in place on the panel support element 10. The remaining panels 120 are fixed  
5 on the support elements 10 in a similar manner. Figure 10 illustrates a completed roof in which a small assembly of six panels have been installed.

For corrugated iron roofs or similar roofs, the support frame may be fixed with the fastener straps 80 as described above, or may be screwed directly to the roof.

10 The top hat section of the members 12, 14, 16 of the panel support elements 10 provides strength to the structure and assists in preventing the panel support elements from flexing.

The panels 120 are raised off the roof to allow free air flow to the back of the panels and avoid the obstruction of rain water flowing down the roof  
15 into the gutter.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to  
20 be considered in all respects as illustrative and not restrictive.

## CLAIMS:

1. A method of forming a framework for mounting panels on a roof, the method comprising the steps of:
  - fixing a first panel support element to a roof, the first panel support  
5 element having engagement means for linking in predetermined juxtaposition with adjacent like panel support elements, each panel support element including support means for releasably receiving and supporting a respective one of the panels;
  - 10 locating a second panel support element adjacent the first element and fixing the second element in a predetermined juxtaposition with the first element by the engagement means; and
  - attaching one of the panels to each panel support element, the arrangement being such that the attached panels are disposed in predefined juxtaposition.
- 15 2. The method of claim 1, wherein the panels form a substantially co-planar array substantially independently of the evenness of the roof.
3. The method of claim 2, wherein the framework, when assembled, provides a substantially rigid structure to support the substantially co-planar array of panels.
- 20 4. The method as claimed in any one of claims 1 to 3, wherein the framework is applied to a tiled roof, and the method further including the steps of:
  - removing a tile from the roof;
  - attaching a depending fastener element to a rafter, or other structural  
25 member of the roof;
  - replacing the tile on the roof such that the upper end of the fastener element is covered but leaving the lower part of the fastener exposed; and
  - attaching the panel support element to the lower part of the fastener element.
- 30 5. The method as claimed in any one of claims 1 to 3, wherein the roof is made of sheet material, and the method includes the step of:
  - attaching a proximal portion of a fastener element to a structural member of the roof through the sheet material; and
  - attaching the panel support element to a distal portion of the fastener  
35 element.

6. The method as claimed in any one of claims 1 to 5, wherein the panels are photovoltaic panels.
7. The method of claim 6, further including the step of prewiring the framework for interconnection of the photovoltaic panels before the panels are mounted on the framework.
8. The method of claim 7, wherein an inverter is provided in association with each photovoltaic panel.
9. The method of claim 8, wherein each inverter is provided with an output connection and at least one input connection connected in parallel to facilitate parallel electrical connection of a series of inverters.
10. The method as claimed in claim 9, further including the step of preforming cables of predetermined length and routing the cables via the panel supporting elements before the panels are mounted on the framework.
11. A panel support element having engagement means for linking the panel support element with an adjacent like panel support element, each panel support element including support means, to support and releasably engage a panel, the engagement means being configured for securing adjacent panel support elements such that their respective panels are disposed in predefined juxtaposition.
12. The panel support element as claimed in claim 11, wherein a first elongate member is provided, having a length  $2L$  and two transversely oriented elongate members each having a length  $L$  are symmetrically disposed between the centre and either end of the first elongate member.
13. The panel support element of claim 12, wherein hinge means are provided at each end of the transverse elongate members, each of the hinge means being configured to co-operate with a hinge bracket provided on the reverse side of the respective panel.
14. The panel support element of claim 13, wherein the elongate members have a substantially constant cross section along their length.
15. The panel support element as claimed in claim 14, wherein a plurality of fastener elements are provided for attaching the panel support element to the roof, the fasteners being in the form of an elongate metal strap.
16. The panel support element of claim 15, wherein the fastener elements are provided with preformed holes to facilitate attachment to the roof and the support element.

17. The panel support element of claim 16, including an attachment clip which cooperates with the cross-section shape of the members of the panel support element, to clip onto the support element, the attachment clip being provided with a plurality of holes to allow adjustable connection of the fastener element by way of a screw or rivet.

18. The panel support element as claimed in claim 17, wherein the holes in the attachment clip differ in pitch when compared with those of the fastener strap to allow a vernier adjustment of the location of the support element.

19. The panel support element as claimed in claim 18, wherein the attachment clip is slidingly engaged with the respective member of the support element to provide adjustment of the location of the support element in the longitudinal direction of the respective member.

20. The panel support element of claim 19, wherein the engagement means comprises bracket elements of a predetermined length defining mating means for engaging with corresponding mating means provided at a predetermined location at or adjacent each end of the members of the panel support element.

21. The panel support element of claim 20, wherein the corresponding mating means includes a pair of detents provided adjacent each end of the first elongate member and the two transverse elongate members.

22. A kit of parts for assembling a supporting frame and fitting a photovoltaic panel to a roof, including:  
a fastener strap and attachment clip  
a panel support element;  
three engagement bracket elements;  
four hinge brackets and attachment means for attaching the hinges to brackets to the back of a photovoltaic panel; and  
a connector cable of sufficient length to reach an adjacent juxtaposed panel or junction box.

23. The kit of parts as claimed in claim 23, further including a photovoltaic panel.

24. The kit of parts as claimed in claim 24, wherein an inverter is included for converting a dc power output of the photovoltaic panel to ac power for connection to an ac power grid or a grid connected building distribution system.
- 5 25. The kit of parts as claimed in claim 25, wherein the kit is packed in a single package.

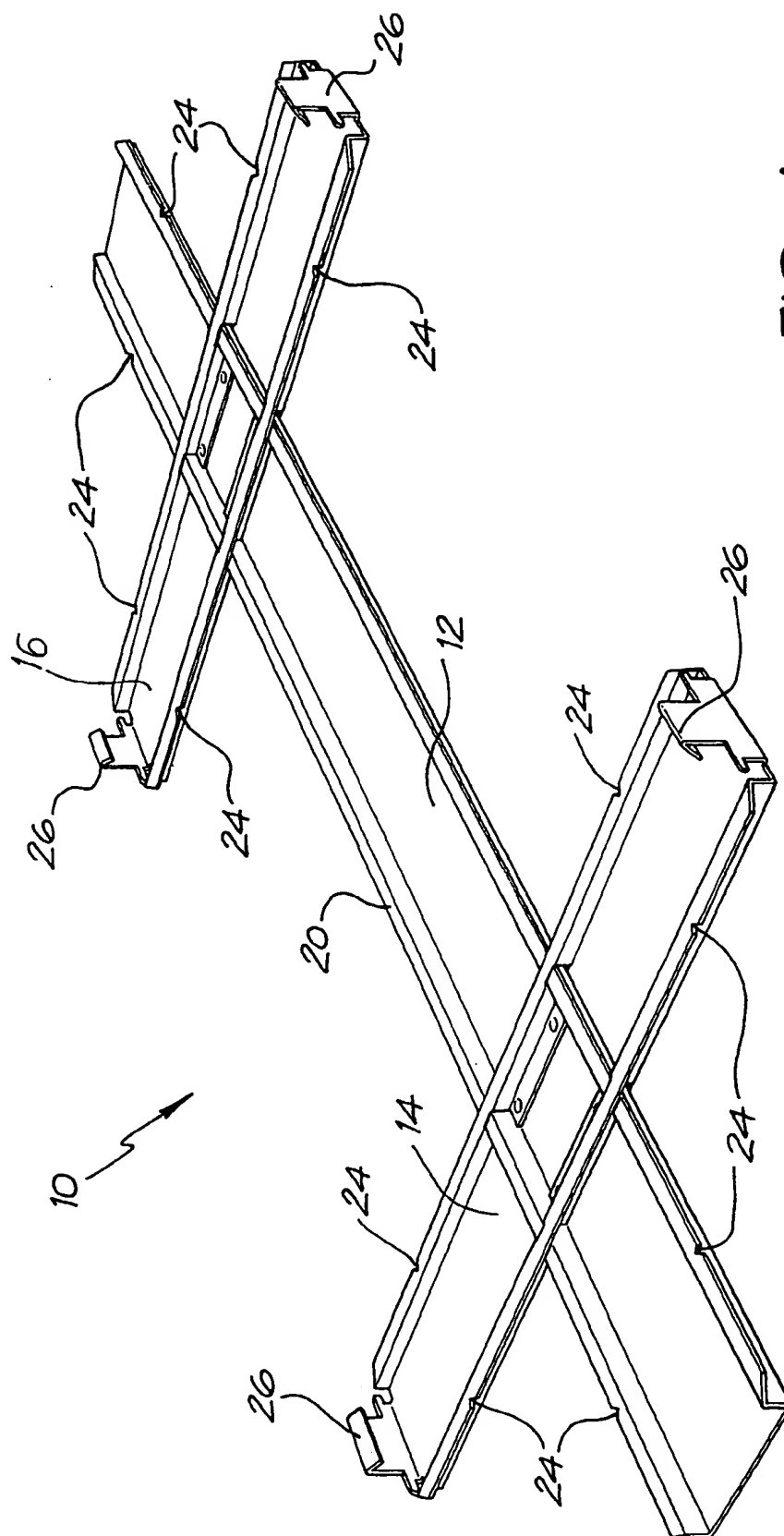


FIG. 1

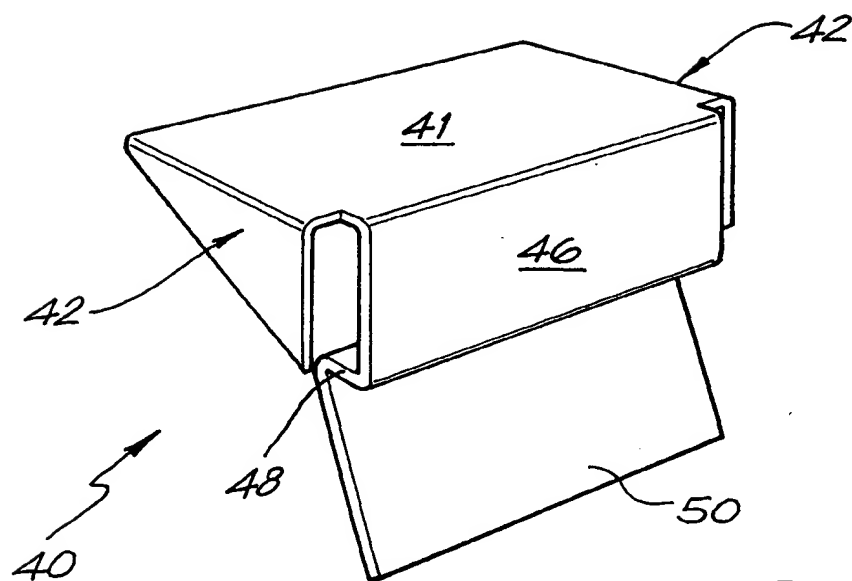


FIG. 2

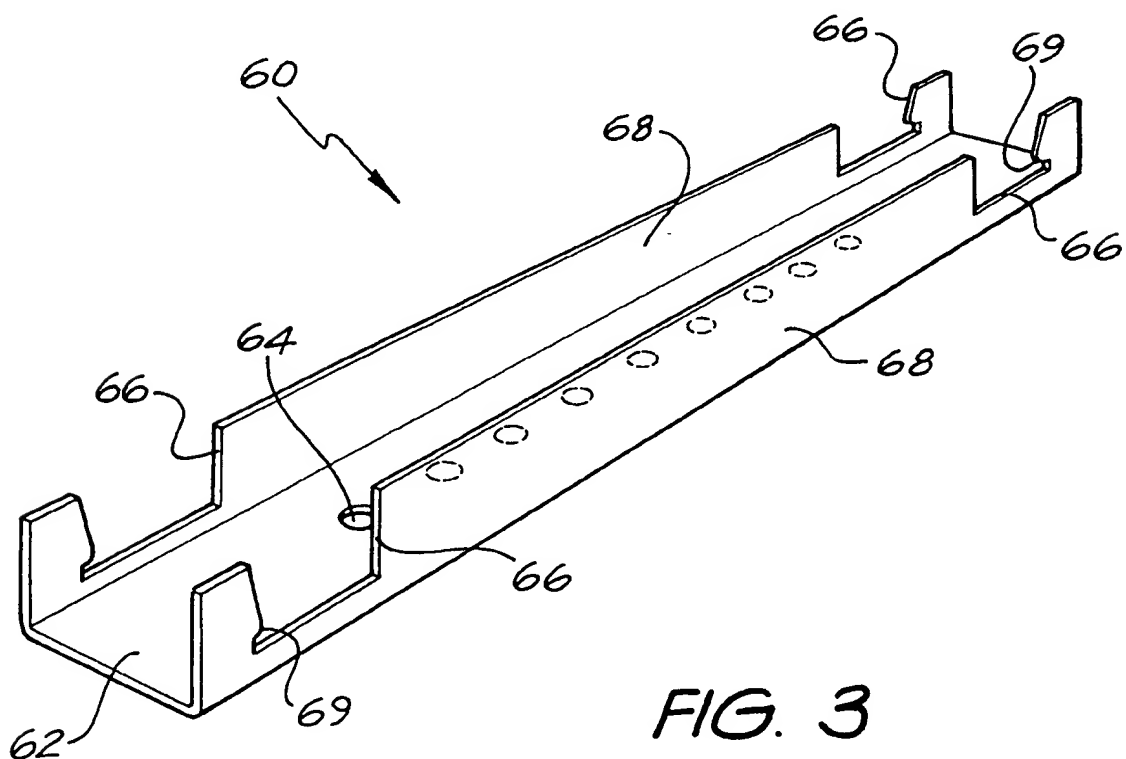


FIG. 3

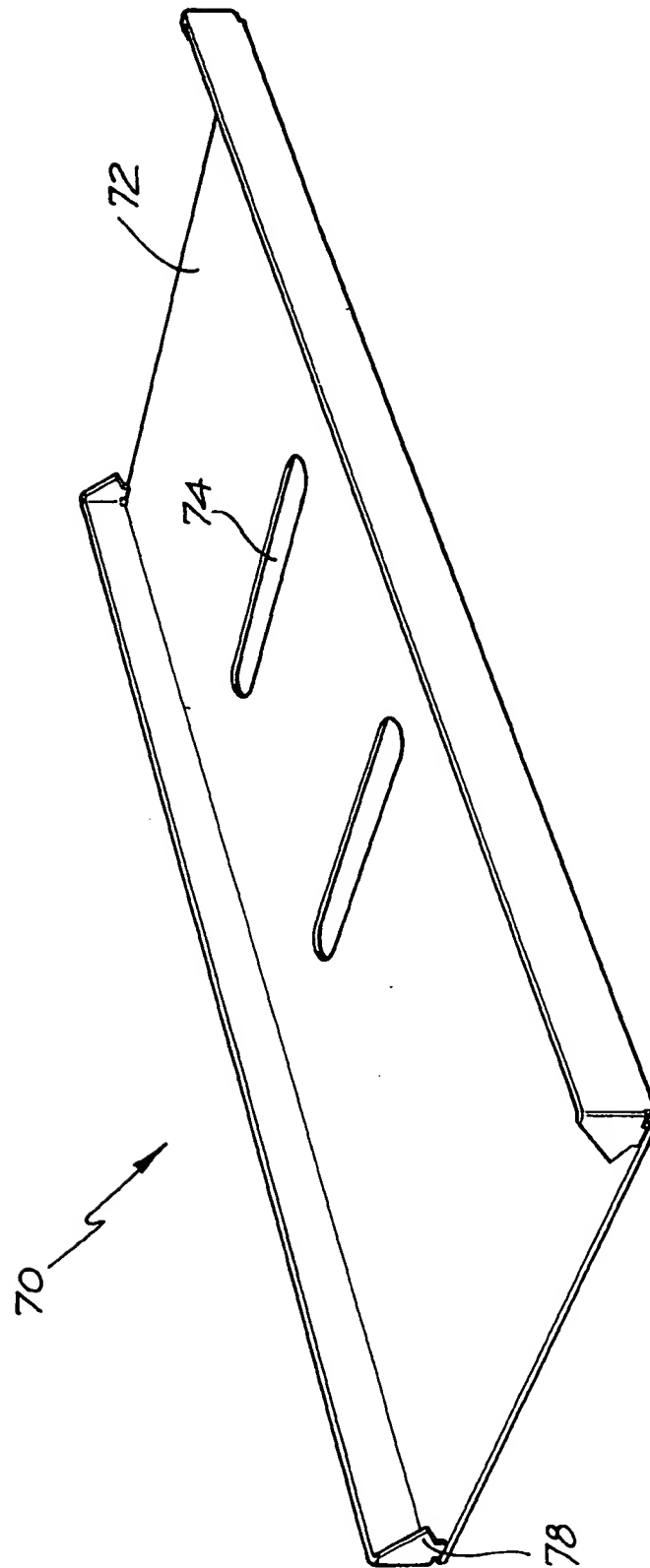
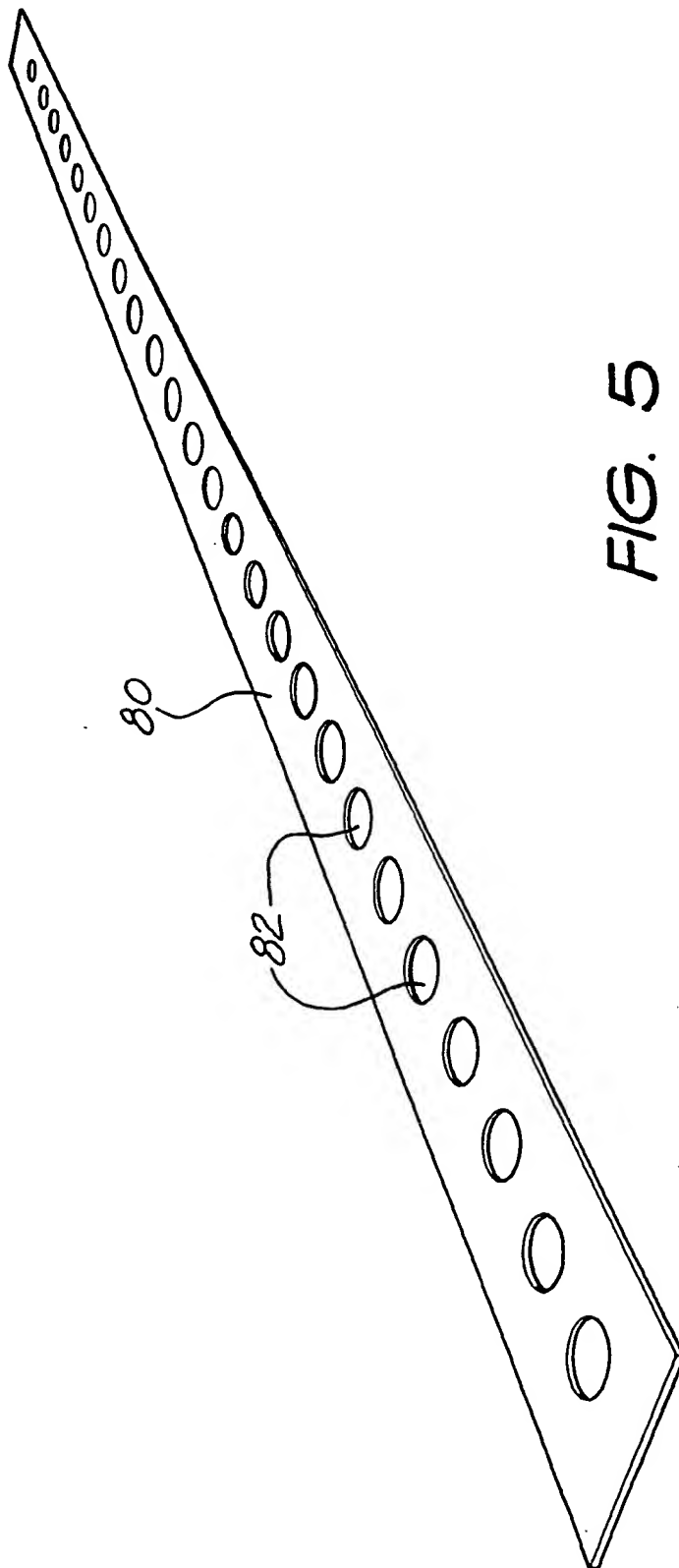


FIG. 4





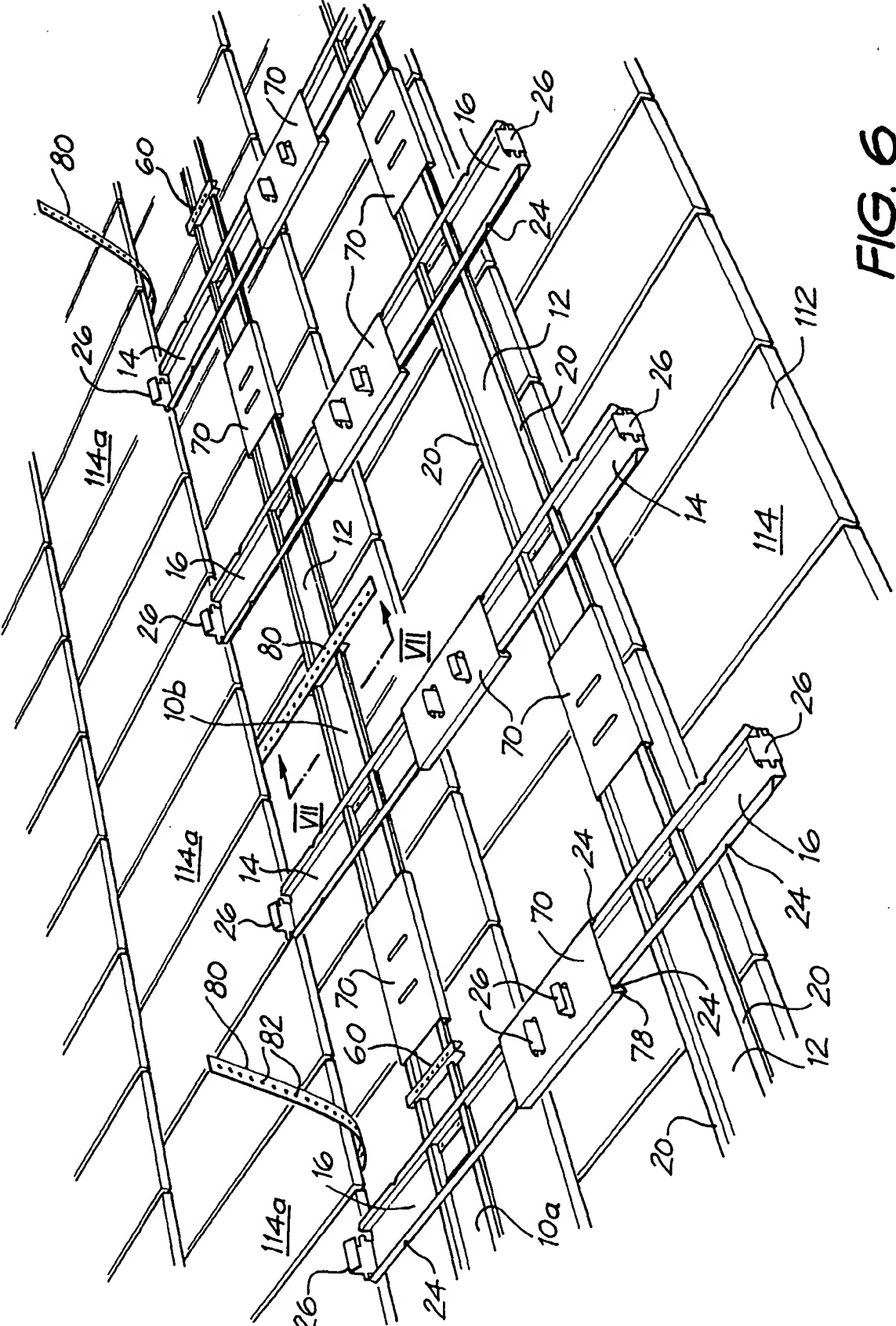


FIG. 6

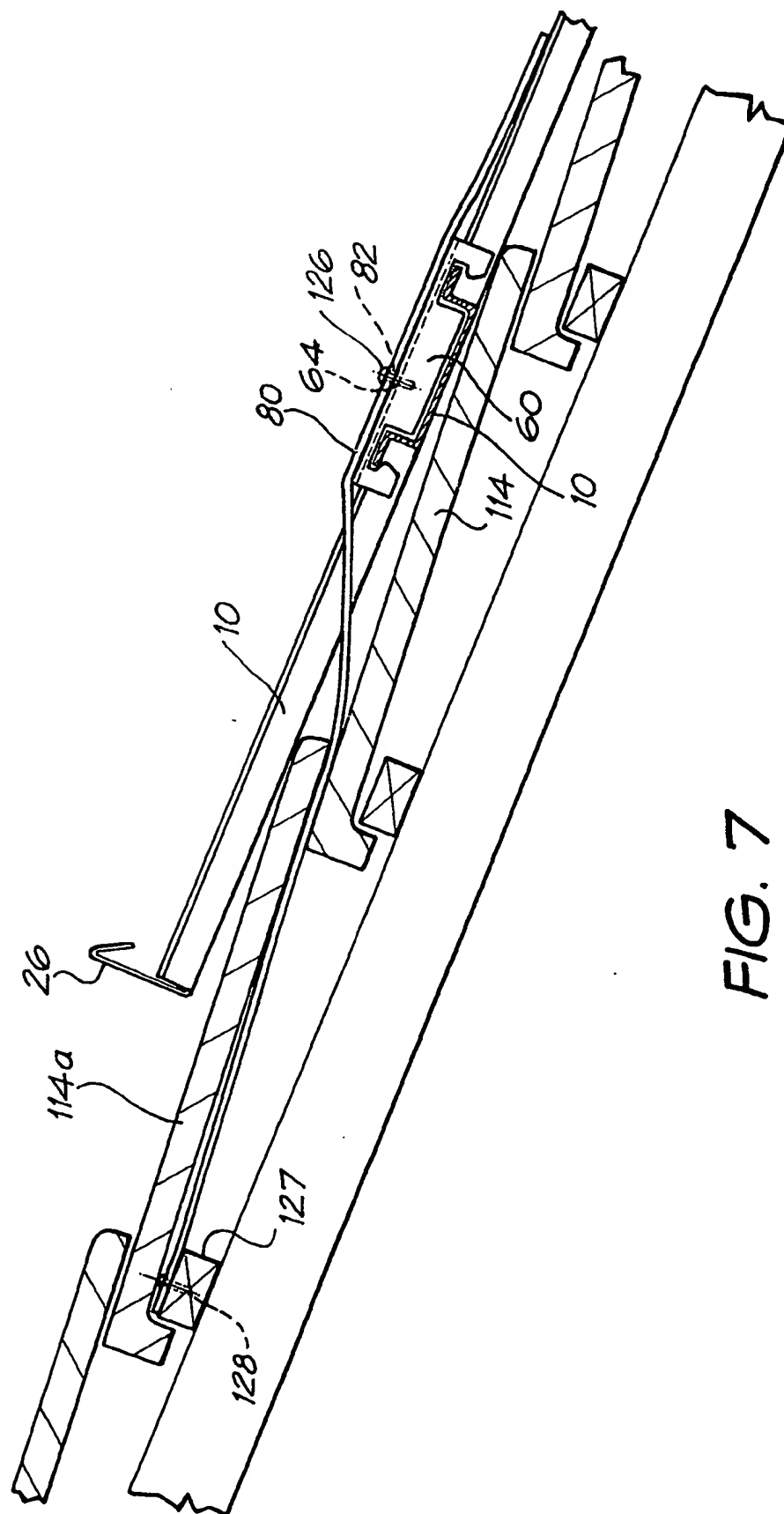


FIG. 7

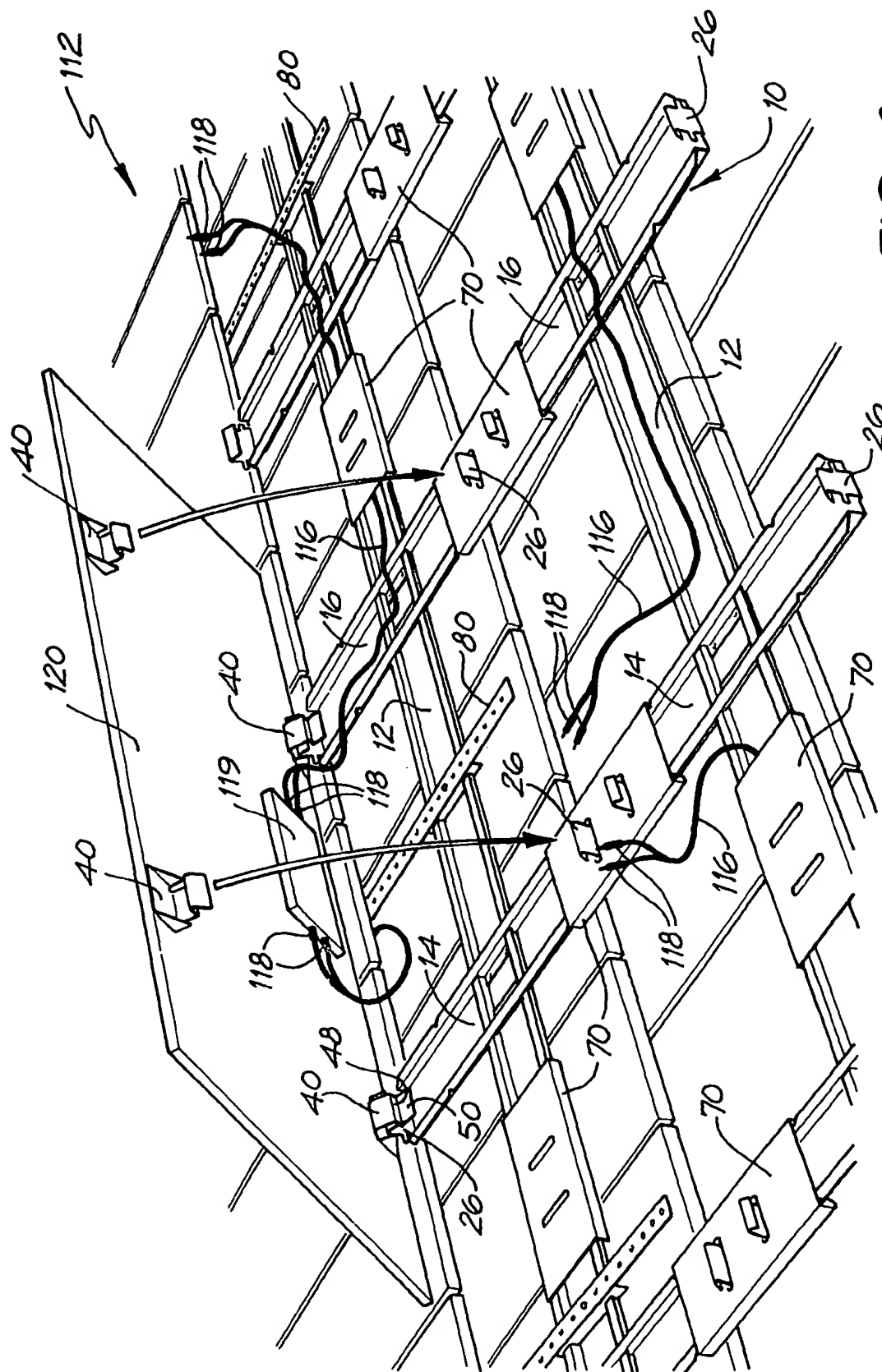


FIG. 8

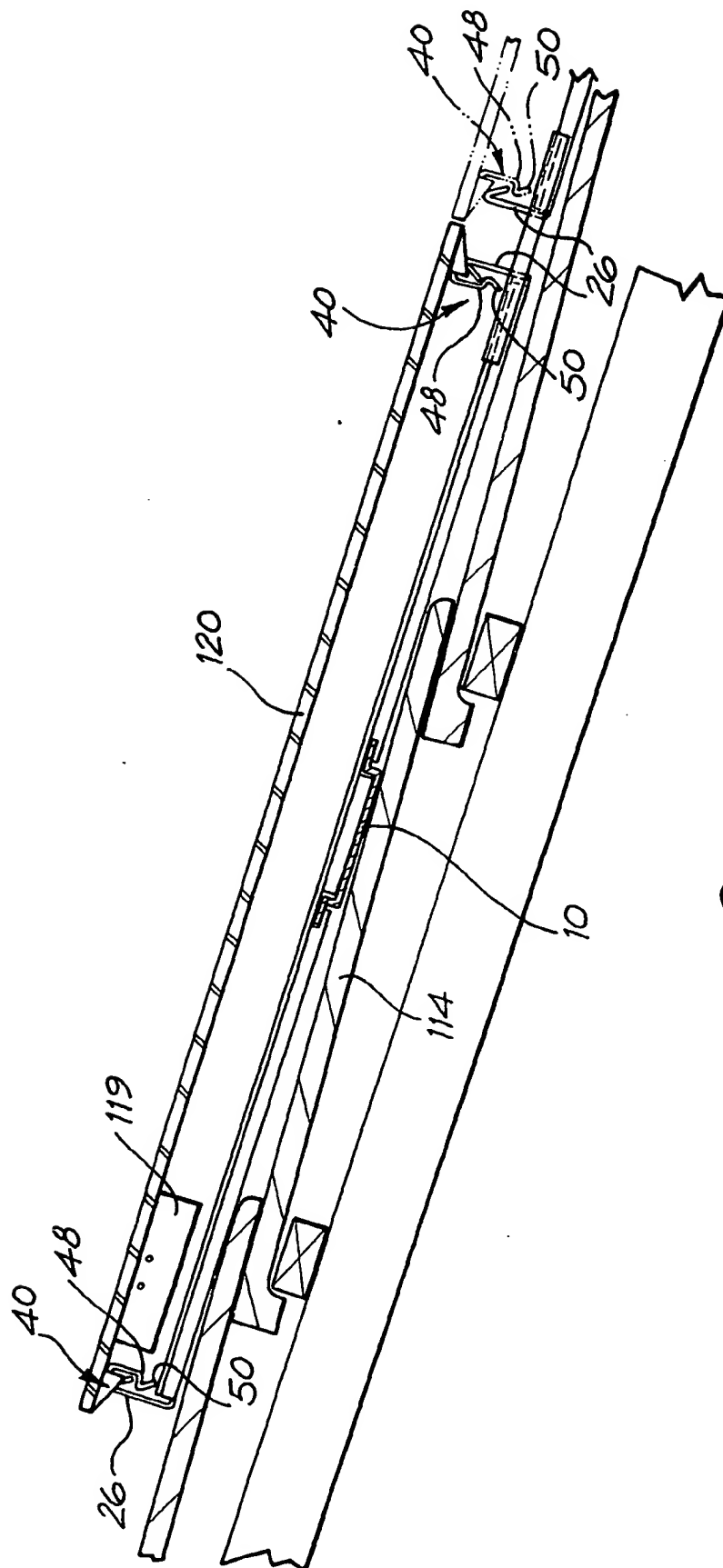


FIG. 9

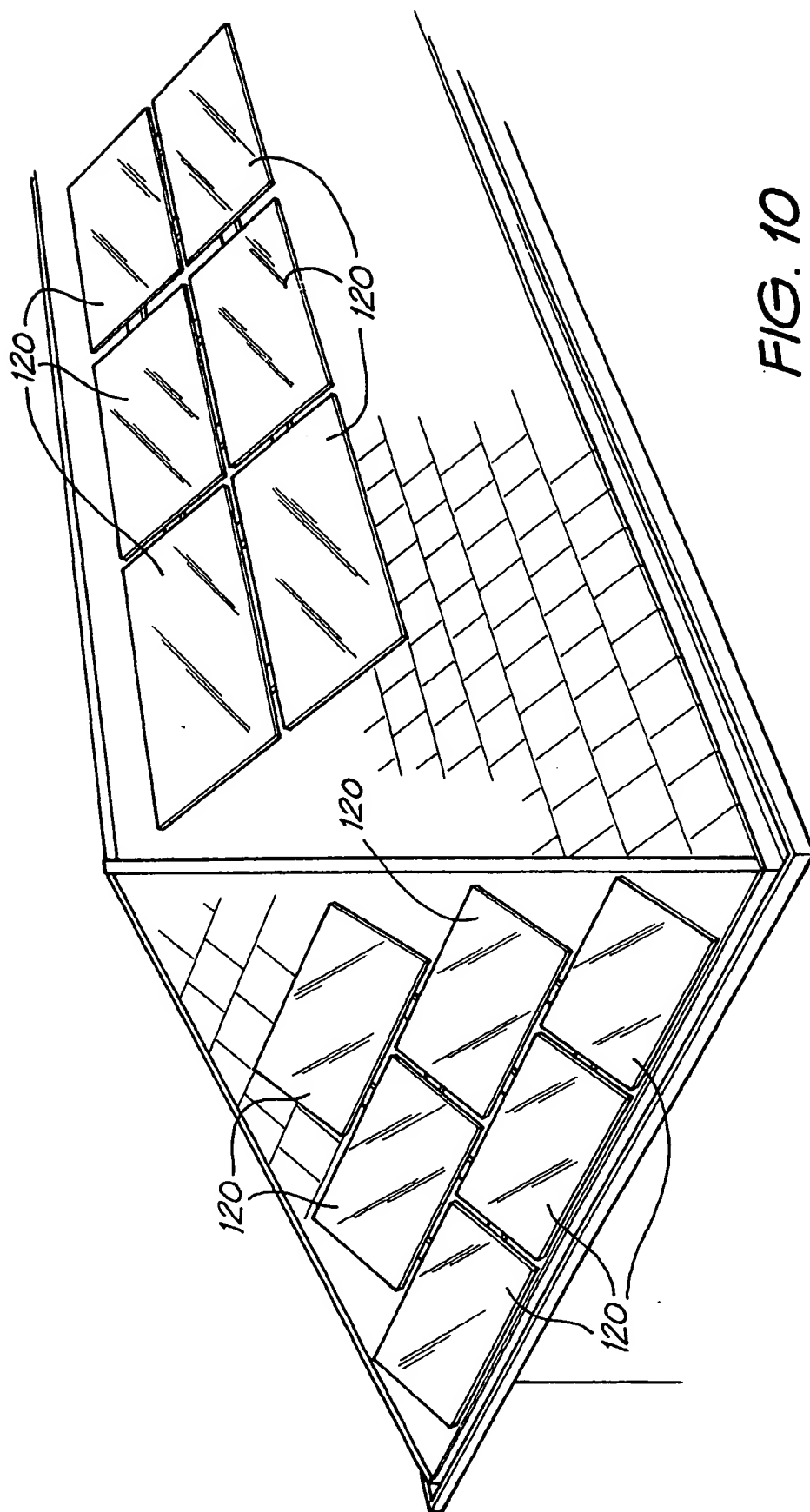


FIG. 10

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 99/00707

|  |   |   |
|--|---|---|
| <b>A. CLASSIFICATION OF SUBJECT MATTER</b>   |   |   |
| Int Cl <sup>6</sup> : E04D 13/18, F24J 2/52  |   |   |
| According to International Patent Classification (IPC) or to both national classification and IPC  |   |   |
| <b>B. FIELDS SEARCHED</b>  |   |   |
| Minimum documentation searched (classification system followed by classification symbols)<br>IPC: E04D 13/00, 13/18; F24J 2/52, 3/02   |   |   |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  |   |   |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>WPAT   |   |   |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>  |   |   |
| Category*  | Citation of document, with indication, where appropriate, of the relevant passages    | Relevant to claim No.   |
| X  | US 5112408 A (MELCHIOR) 12 May 1992<br>Columns 4-7, Figures 1-8                       | 1-3, 6, 11  |
| X  | US 4636577 A (PETERPAUL) 13 January 1987<br>Columns 3-6, Figure 1                     | 1-3, 6-11   |
| X  | DE 3419299 A1 (TELEFUNKEN ELECTRONIC GMBH) 28 November 1985<br>Pages 6-8, Figures 2-5 | 1-3, 6, 11  |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex  |   |   |
| * Special categories of cited documents:<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier application or patent but published on or after the international filing date<br>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br>"O" document referring to an oral disclosure, use, exhibition or other means<br>"P" document published prior to the international filing date but later than the priority date claimed<br>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<br>"&" document member of the same patent family |   |   |
| Date of the actual completion of the international search<br>19 October 1999   |   | Date of mailing of the international search report<br>22 OCT 1999       |
| Name and mailing address of the ISA/AU<br>AUSTRALIAN PATENT OFFICE<br>PO BOX 200<br>WODEN ACT 2606<br>AUSTRALIA<br>Facsimile No.: (02) 6285 3929   |   | Authorized officer<br><br>MICHAEL HALL<br>Telephone No.: (02) 6283 2474 |

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 99/00707

**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                     | Relevant to claim No. |
|-----------|--|-----------------------|
| X         | US 4189881 A (HAWLEY) 26 February 1980<br>Whole document   | 1-3, 6-11             |
| X         | US 5193603 A (WHISNANT) 16 March 1993<br>Columns 3-4, Figures 1, 4   | 11                    |
| A         | Derwent Abstract Accession No. 97-498794/46, Class X15, JP 9-235844 A (SHIROKI KOGYO KK) 9 September 1997.<br>Abstract | 1-25                  |



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU 99/00707

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report |         |    |         | Patent Family Member |        |    |              |
|--|---------|----|---------|----------------------|--------|----|--------------|
| US                                     | 5112408 | DE | 4002711 | EP                   | 440103 |    |              |
| US                                     | 4636577 | CA | 1248582 | EP                   | 137666 | JP | 60089986     |
| US                                     | 5193603 | CA | 2085208 | EP                   | 546492 |    |              |
|  |         |    |         |                      |        |    | END OF ANNEX |

6. The method as claimed in any one of claims 1 to 5, wherein the panels are photovoltaic panels.

7. The method of claim 6, further including the step of prewiring the framework for interconnection of the photovoltaic panels before the panels are mounted on the framework.

8. The method of claim 7, wherein an inverter is provided in association with each photovoltaic panel.

9. The method of claim 8, wherein each inverter is provided with an output connection and at least one input connection connected in parallel to facilitate parallel electrical connection of a series of inverters.

10. The method as claimed in claim 9, further including the step of preforming cables of predetermined length and routing the cables via the panel supporting elements before the panels are mounted on the framework.

11. A panel support element having engagement means for linking the panel support element with an adjacent like panel support element, each panel support element including support means, to support and releasably engage a panel, the engagement means being configured for securing adjacent panel support elements such that their respective panels are disposed in predefined juxtaposition.

12. The panel support element as claimed in claim 11, wherein a first elongate member is provided, having a length  $2L$  and two transversely oriented elongate members each having a length  $L$  are symmetrically disposed about the centre of the first elongate member.

13. The panel support element as claimed in claim 12, wherein the transversely oriented elongate members are located midway between the centre and either end of the first elongate member.

14. The panel support element of claim 12 or 13, wherein hinge means are provided at each end of the transverse elongate members, each of the hinge means being configured to cooperate with a hinge bracket provided on the reverse side of the respective panel.

15. The panel support element of claim 14, wherein the elongate members have a substantially constant cross section along their length.

16. The panel support element as claimed in claim 15, wherein a plurality of fastener elements are provided for attaching the panel support element to the roof, the fasteners being in the form of an elongate metal strap.

ART 34 ABST

17. The panel support element of claim 16, wherein the fastener elements are provided with preformed holes to facilitate attachment to the roof and the support element.

5 18. The panel support element of claim 17, including an attachment clip which cooperates with the cross-section shape of the members of the panel support element, to clip onto the support element, the attachment clip being provided with a plurality of holes to allow adjustable connection of the fastener element by way of a screw or rivet.

10 19. The panel support element as claimed in claim 18, wherein the holes in the attachment clip differ in pitch when compared with those of the fastener strap to allow a vernier adjustment of the location of the support element.

15 20. The panel support element as claimed in claim 19, wherein the attachment clip is slidably engaged with the respective member of the support element to provide adjustment of the location of the support element in the longitudinal direction of the respective member.

20 21. The panel support element as claimed in any one of claims 11 to 20, wherein the engagement means comprises bracket elements of a predetermined length defining mating means for engaging with corresponding mating means provided at a predetermined location at or adjacent each end of the members of the panel support element.

22. The panel support element of claim 21, wherein the corresponding mating means includes a pair of detents provided adjacent each end of the first elongate member and the two transverse elongate members.

25 23. A kit of parts for assembling a supporting frame and fitting a photovoltaic panel to a roof, including:

a panel support element;

a fastener strap and attachment clip for fastening the panel support element to a roof;

30 three engagement bracket elements for linking the supporting frame to adjacent frames in predetermined juxtaposition;

four hinge brackets and attachment means for attaching the hinge brackets to the back of a photovoltaic panel; and

35 a connector cable of sufficient length to connect a photovoltaic panel to an adjacent juxtaposed panel or junction box.

24. The kit of parts as claimed in claim 23, further including a photovoltaic panel.

25. The kit of parts as claimed in claim 24, wherein an inverter is included for converting a dc power output of the photovoltaic panel to ac power for connection to an ac power grid or a grid connected building distribution system.

26. The kit of parts as claimed in claim 25, wherein the kit is packed in a single package.